Tritium Leaks

• Approximately 70% of plants have had some leakage, a list of plants with leaks is on NRC public web site

• Most leaks are from non-safety related, underground piping
  – onsite groundwater contamination up to 19 million pCi/L
  – No tritium from leaks detected offsite except at Braidwood

• NRC has determined leaks have very low safety significance

• However, significant public, media, State and Congressional interest
NRC Actions

- NRC is cooperating with other federal (EPA) and state agencies, tribal and local governments on groundwater protection
- Industry initiated a voluntary ground water monitoring program
- NRC is monitoring the effectiveness of the industry groundwater protection initiatives, but no regulatory basis for enforcement.
Background

- NRC is responsible to regulate and ensure adequate protection of public health and safety

- Nuclear plants are not zero-release plants
  - Normal effluent discharges are:
    - 100 – 500 Ci tritium via liquid effluents to waterways
    - 100 Ci tritium to gaseous effluents

- Nuclear plants release radioactive effluents under ALARA controls [“as low as is reasonably achievable”]
  - Less than 3 mrem/yr from liquid effluents
Radioactive Effluents

• Nuclear plants produce 20% of electricity in USA

• Nuclear plant radioactive effluents are low, ~30 times below regulatory limits

• US radiation dose
  – 620 mrem/yr from background and medical
  – Typically less than 1 mrem/yr from nuclear plants
  – Radiation dose from leaks ~ 0 mrem/yr
Regulatory Framework

• NRC has authority under the Atomic Energy Act and Energy Reorganization Act of 1974

• EPA authorities under Clean Water Act, Safe Drinking Water Act, CERCLA, RCRA, and 40 CFR 190

• States have authorities under both EPA & State’s rights to set state health and safety standards
Regulatory Impact

- NRC regulatory focus is on human safety vs. environment protection

- Tritium contaminated areas are generally very small areas, and are localized “on-site” with slow leakage to off-site areas

- Radioactive leaks have little safety significance (zero or very close to zero dose)

- However, some members of public expect NRC to prevent all leaks and to protect environmental resources
Hydrogeology

• Nuclear (and coal) plants are built on lakes and rivers (need cooling water for steam turbines)

• Subsurface, underground water flow is generally toward the lakes and rivers (away from drinking water wells)

• Tends to flush leaks out of ground water and into the lakes and rivers, drinking water supplies have been mostly unaffected

• Some potential for minor impacts to drinking water aquifers
Public Concern

• Very high public concern

• Public mindset that plants are not supposed to leak

• Fear of contaminating drinking water supplies

• Expect inspection and maintenance to prevent leaks
Issues from Public Meetings

• How can NRC allow plants to leak tritium?

• Why aren’t NRC regulations preventing leaks/spills to groundwater?

• Why doesn’t the NRC protect the environment?

• What enforcement actions are NRC taking?
Maintain Barriers

- Underground piping – not designed for routine inspection, difficult to inspect
- Some piping is being brought above ground
- Leaks viewed by public as inadequate maintenance of entire plant
NRC Enforcement Actions

• Public perceive need for more reliable NRC enforcement actions

• NRC response to events – seen as variation in NRC response

• Better real-time communication needed – both internal and external
Strengthen Trust

• Need to communicate promptly, effectively, and clearly

• Loss of trust when environmental leaks occur

• Loss of trust when NRC fails to require maintenance to prevent leaks

• Loss of trust when remediation is not required
Nuclear Industry Response

Nuclear Energy Institute – Ground Water Protection Initiative

- Voluntary initiative – above and beyond regulations

- Develop a ground water protection program
Industry Initiative

• Improve management of leaks

• Improve communications with external stakeholders
Industry Initiative

- Perform subsurface hydrogeology study to identify ground water flow directions
- Evaluate piping and systems containing radioactive fluids and determine the risk of leakage
- Install ground water monitoring wells
- Establish decision making plan for remediation
- Notify State and local authorities early
Industry Initiatives

• Buried Piping Integrity Initiative
  – Develop buried piping program
  – Prioritize piping inspections through risk ranking
  – Perform piping inspections
Offsite Discharges

• NRC is developing model to calculate offsite discharges
• Determine groundwater concentrations
• Multiply by cross sectional area
• Multiply by groundwater flow rate
• Estimate < 1 curie per year
NRC Website Links

- [http://pbadupws.nrc.gov/docs/ML1415/ML14157A132.pdf](http://pbadupws.nrc.gov/docs/ML1415/ML14157A132.pdf)
- [http://pbadupws.nrc.gov/docs/ML0931/ML093160004.pdf](http://pbadupws.nrc.gov/docs/ML0931/ML093160004.pdf)
- [http://pbadupws.nrc.gov/docs/ML1100/ML110050525.pdf](http://pbadupws.nrc.gov/docs/ML1100/ML110050525.pdf)
- [http://pbadupws.nrc.gov/docs/ML0703/ML070300534.pdf](http://pbadupws.nrc.gov/docs/ML0703/ML070300534.pdf) (see pages 16 - 19)